MAPPING OF THE HECATE CHASMA QUADRANGLE (V-28), VENUS

Ellen R. Stofan[1, 2] and John E. Guest[2]

[1]Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109; [2]Department of Geological Sciences, University College London.

We are mapping the Hecate Chasma quadrange (V-28) at 1:5,000,000 scale as part of the NASA Planetary Geologic Mapping Program. V-28 covers the region from 0°-25° N. and 240°-270° E. Magellan synthetic aperture radar (SAR) data are used for the map base. Standard planetary geologic mapping techniques [e.g. 1, 2] are being used to construct a geologic map for the Hecate Chasma quadrangle. Mappable geologic features within the quadrangle include thirteen impact craters, several large volcanoes, over eleven coronae of varying morphology, three chasmata, and the northern portion of Hinemoa Planitia.

Full-resolution Magellan image mosaics (FMAP's) and synthetic parallax stereo images, produced by the U.S. Geological Survey, are being used to aid in determining the stratigraphic relations between map units. Unit characters and boundary locations not resolvable at C1-MIDR scale (250 m/pixel) were clearly seen at FMAP scale (75 m/pixel). The large format of the FMAP prints, the synthetic stereo data, and the digital data are key to determining stratigraphic relations. Apparently contradictory stratigraphic relations between major map units are commonly caused by the presence of additional subtle units only noticeable through digital manipulation of FMAP data. Magellan altimetry, roughness, reflectivity, and emissivity datasets [3, 4] provide additional information on map units.

There are difficulties in utilizing radar data to construct a geologic map [e.g. 5]. Geologic units will only be visible in radar images if they have backscatter characteristics distinctly different from surrounding units. In volcanic or plains regions, younger and older units are likely to be mistakenly incorporated into a single unit if they have similar backscatter characteristics. If the surface of a unit changes laterally, and thus potentially its radar signature changes also, it may be mapped incorrectly as two or more units. In addition, structures tend to be more visible if they are oriented perpendicular to the radar look-direction [e.g. 6]. Thus, in Magellan data, north-south-trending lineaments will tend to be well defined, but east-west structures are likely to be underrepresented or only weakly represented in the data unless associated with a rough talus slope.

The V-28 quadrangle contains a wide range of volcanic features with mappable deposits, from shields at the limits of resolution of the data to a large volcano (Polik-mana Mons, 24.8° N., 264° E.). Polik-mana Mons, diameter >600 km, is superposed on Hecate Chasma. A smaller construct, Shulzenko Patera (6.1° N., 264.5° E.), lies in Hinemoa Planitia to the south of Hecate Chasma, with surrounding flow deposits which postdate both the local plains as well as flows from Aruru Corona. Most of the coronae in the quadrangle have associated volcanic activity, including interior constructs and flows as well as surrounding volcanic deposits. Aruru Corona, at 9° N., 262° E., has the largest volume of associated volcanic deposits of any of the coronae in the quadrangle. It is morphologically similar to Benten Corona [7] and also appears to have undergone multiple phases of annulus formation. Taranga Corona, at 16° N., 252° E., has much less associated volcanism, with some interior flows and surrounding deposits.

The V-28 quadrangle contains three chasmata: Hecate, Zverine, and an unnamed chasma (chasma A) parallel to Hecate, which

lies south of Taranga Corona. Hecate Chasma and chasma A have numerous coronae along them. In this quadrangle, Zverine has no coronae, but has rifted apart a large volcano at 19° N., 267° E. Hecate Chasma extends for over 8000 km, from Atla Regio through Asteria Regio [8]. It is a discontinuous trough and fracture system, with en echelon offset along strike. Regions where the trough is more distinct tend to be characterized by more dense fracture spacing [8]. Coronae along this chasma range from 85 to over 500 km in diameter. Some coronae are topographic highs (domes, plateaus, rimmed plateaus) whereas others are depressions or rimmed depressions. Coronae along chasma A are most commonly depressions.

We have mapped over ten plains units on the Hinemoa Planitia region, indicating that multiple episodes of plains volcanism have occurred over the last approximately 700 m.y. These plains were cut by rifting, which occurred concurrent with corona and volcano formation.

References: [1] Wilhelms, D.E. 1972, Geologic mapping of the second planet, USGS Interagency report, Astrogeology 55; [2] Wilhelms, D.E. 1990, Geologic mapping, *in* Planetary mapping, Greeley, R. and Batson, R.M., eds. Cambridge University Press, 296 p.; [3] Pettengill et al. 1992, Venus surface radiothermal emission as observed by Magellan, JGR, 97, 13,091-13,102; [4] Campbell, B. 1998, Surface formation rates and impact crater densities on Venus, JGR; [5] Ford, J.P. et al. 1993, Guide to Magellan Image Interpretation, JPL Publ. 93-24, 148 p.; [6] Stofan, E.R. et al. 1989, Geology of a Venus rift zone: Beta Regio and Devana Chasma, GSA Bull., 101, 143-156; [7] Copp et al. 1998, New insights into coronae evolution: Mapping on Venus, JGR, 103, 19,401-19,417; [8] Hamilton, V.E. and E.R. Stofan 1996, The geomorphology and evolution of Hecate Chasma, Venus, Icarus 121, 171-194.